

WHAT IS CLAIMED IS:

- 1 1. A lamp driving apparatus, comprising:
 - 2 a controller, which outputs a switch control signal and a lamp driving
 - 3 control signal in response to an instructing signal for instructing a lamp to be
 - 4 turned on and off;
 - 5 a lamp driver, which supplies an electric power to the lamp in
 - 6 accordance with the lamp driving control signal;
 - 7 a lamp voltage detector, which detects a voltage applied to the lamp,
 - 8 and outputs a detecting signal showing the applied state of the voltage to the
 - 9 controller;
 - 10 a switch, connected to the lamp driver, a lamp driving power supply
 - 11 line, and a preliminary power supply line, and which switches between a first
 - 12 state and a second state selectively;
 - 13 wherein the first state is a state that the electric power for
 - 14 driving the lamp can be supplied to the lamp driver from the lamp driving power
 - 15 supply line; and
 - 16 wherein the second state is a state that the electric power for
 - 17 driving the lamp can be supplied to the lamp driver from the preliminary power
 - 18 supply line; and
 - 19 a switching controller, which controls a switching of the switch in
 - 20 accordance with the switch control signal,
 - 21 wherein the controller outputs the switch control signal so as to make
 - 22 the switch to the first state when the instructing signal for instructing the lamp
 - 23 to be turned on; and

24 wherein the controller outputs the switch control signal so as to make
25 the switch to the second state in a case that the detecting signal showing an
26 abnormal applied state of the voltage is received from the lamp voltage
27 detector while the controller outputs the lamp driving control signal for turning
28 on the lamp.

1 2. The lamp driving apparatus as set forth in claim 1, wherein the switch
2 includes a relay which having;
3 a first relay contact, electrically connected to the lamp driver;
4 a second relay contact, electrically connected to the lamp
5 driving power supply line;
6 a third relay contact, electrically connected to the preliminary
7 power supply line;
8 a contact piece, electrically connecting the first relay contact
9 to the third relay contact in an initial state; and
10 an electromagnetic coil, switching the contact piece so as to
11 remove the contact piece from the third relay and so as to electrically connect
12 the first relay contact with the second relay contact when an electric current is
13 supplied to the electromagnetic coil; and
14 wherein the switching controller includes a relay driver which supply
15 the electric current to the electromagnetic coil in accordance with the switch
16 control signal.

1 3. The lamp driving apparatus as set forth in claim 1, wherein the lamp
2 driver supplies the electric power to the lamp in accordance with a wave form

3 of the lamp driving control signal.

1 4. The lamp driving apparatus as set forth in claim 1, wherein the
2 controller outputs the lamp driving control signal having a pulse wave form in
3 voltage when the switch is in the first state; and

4 wherein the controller outputs the lamp driving control signal having a
5 DC voltage when the switch is in the second state.

1 5. The lamp driving apparatus as set forth in claim 1, wherein the lamp
2 voltage detector outputs the detecting signal showing the abnormal applied
3 state of the voltage to the controller when detecting that a DC voltage applied
4 to the lamp is higher than a predetermined voltage.

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1 6. The lamp driving apparatus as set forth in claim 1, wherein the lamp
2 voltage detector outputs the detecting signal showing the abnormal applied
3 state of the voltage to the controller when detecting that no voltage is applied
4 to the lamp.

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1 7. The lamp driving apparatus as set forth in claim 5, wherein the
2 controller compares a time length of a high level voltage of the detecting signal
3 with that of the lamp driving control signal; and

4 wherein the controller outputs the switch control signal so as to make
5 the switch to the second state on the basis of the comparing.

1 8. The lamp driving apparatus as set forth in claim 6, wherein the

2 controller compares the voltage applied to the lamp with threshold voltage data
3 stored therein; and

4 wherein the controller outputs the switch control signal so as to make
5 the switch to the second state on the basis of the comparing.

1 9. A lamp driving apparatus, comprising:

2 a controller, which outputs a relay driving control signal and a first
3 lamp driving control signal in response to an instructing signal for instructing a
4 lamp to be turned on and off;

5 a lamp driver, which supplies an electric power to the lamp in
6 accordance with the first lamp driving control signal;

7 a relay, which includes:

8 a first relay contact, electrically connected to the lamp driver;

9 a second relay contact, electrically connected to the lamp
10 driving power supply line for supplying an electric power to the lamp driver;

11 a third relay contact, electrically connected to the preliminary
12 power supply line for supplying an electric power to the lamp driver instead of
13 connection to the lamp driving power supply line;

14 a contact piece, electrically connecting the first relay contact
15 to the third relay contact in an initial state; and

16 an electromagnetic coil, switching the contact piece so as to
17 remove the contact piece from the third relay and so as to electrically connect
18 the first relay contact with the second relay contact when an electric current is
19 supplied to the electromagnetic coil;

20 a relay driver, which supplies the electric current to the

21 electromagnetic coil in accordance with the relay driving control signal; and
22 a coil voltage detector, which detects a voltage applied to the
23 electromagnetic coil, and outputs a detecting signal showing the applied state
24 of the voltage to the controller,
25 wherein the controller outputs the first lamp driving control signal for
26 controlling the lamp to be turned on, after the controller outputs the relay
27 driving control signal based on the instructing signal for instructing a lamp to
28 be turned on so that the relay is made to a state that the electric power for
29 driving the lamp can be supplied to the lamp driver from the lamp driving power
30 supply line; and
31 wherein the controller outputs a second lamp driving control signal
32 being different from the first lamp driving control signal in kind of a wave form
33 in a case that the detecting signal showing that no voltage is applied to the
34 electromagnetic coil is received from the lamp voltage detector while the
35 controller outputs the relay driving control signal.

1 10. The lamp driving apparatus as set forth in claim 9, wherein the first
2 lamp driving control signal has a pulse wave form in voltage; and
3 wherein the second lamp driving control signal has a DC voltage.